

the Citrus Industry

In This Issue--

Control of Stem End Rot
and Mold

Trends in the Processing
Industry

Citrus School at Florida
Southern College

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Publication office at Bartow, Florida. Entered as second class matter February 16, 1920, at the post office at Tampa, Florida, under the act of March 3, 1879. Entered as second class matter June 19, 1933, at the post office at Bartow, Florida, under act of March 3, 1879.

The Use of Diphenyl In The Control Of Stem-end Rot and Mold In Citrus Fruits . . .

Since the observation by Tomkins (9) in 1935 that the chemical Diphenyl (or Biphenyl C₆H₅-C₆H₅) is effective in reducing decay in citrus fruits and other fruits and vegetables, considerable effort has been directed towards making practical use of it in the citrus industry. Earlier work along this line was carried out in Palestine (2, 3, 4) in attempts to protect fruits from decay during shipments from that country to England. In that work, paper impregnated with diphenyl was used to wrap the fruit. Good control in such tests was reported by Farkas (2); in one case the "wastage" was reduced from 54.2 per cent in the checks to 5.4 per cent in the diphenyl wraps; in another instance (3) decay was reduced from 46.3 per cent to 11.2 per cent. A patent (US 2,265,522) on diphenyl wraps for the preservation of citrus fruit was

E. F. HOPKINS AND K. W. LOUCKS
1, 2

obtained by Farkas.

In Australia, Huelin (6) mentions the use of diphenyl wraps, containing 100 mgs. of the chemical per wrap, on oranges, mandarines and grapefruit. Reduction of both mold and storage spot are reported.

While, to our knowledge, diphenyl wraps and bags and various types of paper box liners impregnated with diphenyl are manufactured and being used for commercial shipments, especially overseas from the United States, there appear to be very few references published in regard to such shipments or on experimental work to determine the amount of control of decay with diphenyl used in this manner. A short note referring to investigations by the U. S. Department of Agriculture appeared in Citrus (6) in which extremely effective control of stem-end rot and mold in Florida citrus fruit is claimed. Ramsey, Smith and Heiberg (8) report that unwrapped oranges in the presence of paper trays impregnated with diphenyl developed little or no decay. In this and another article (5) it was shown in pure culture tests that the action of diphenyl on a number of organisms, including the mold and stem-end rot fungi that attack citrus, is fungistatic rather than fungicidal.

At this Station, four experiments were carried out by the writers in June 1944. Diphenyl wraps containing approximately 30 milligrams of chemical per wrap were applied to Valencia oranges harvested by clipping and also by pulling and for each sort both ethylene and treated fruits and untreated fruits were used. Briefly, after holding for two weeks, oranges not subjected to ethylene had, in comparison with the checks, about 50 per cent less decay in the diphenyl wraps. After three weeks, the reduction over the checks was only about 45 per cent with no essential difference between clipped and pulled fruits. No reduction was obtained in the case of ethylene treated fruits. Failure to obtain better control appears, in the light of more recent experience with diphenyl to have been due to several factors such as a relatively small dosage of the compound and storage of the wrapped fruits in open field crates in a ventilated holding room. Valencia oranges harvested late in the season may also have contributed to this result. Because of

1. This investigation was carried on at the Florida Citrus Experiment Station, Lake Alfred, Florida, with funds provided by the Florida Citrus Commission, Lakeland, Florida.

2. The assistance of Mr. Cleveland B. G. Rettig in carrying out these experiments is hereby acknowledged.

the apparently wide use of diphenyl commercially in shipments of citrus fruits, an extensive series of holding tests was planned and carried out during the 1946-47 season to carefully evaluate the effectiveness of diphenyl in controlling decay.

Methods

In this investigation, which covered the entire fruit season, six varieties of citrus fruits were used, seedy and seedless grapefruit and Hamlin, Parson Brown, Pineapple and Valencia oranges. For each variety, eight experiments were set up, four in which the fruit was degreened with ethylene for forty-four hours, during the period when this was being done commercially and four in which the coloring treatment was not used. Pickings were made so as to extend the experiments as nearly as possible over the normal season for each variety.

For a given experiment, all fruits were processed in a small packing house unit, waxed with water wax emulsion and randomized one fruit at a time into sub-lots corresponding to the number of treatments to be made. Aside from miscellaneous tests and experiments, the main items in each experiment were:

Checks, unwrapped

Ordinary wraps

Diphenyl wraps

Diphenyl boxliners with diphenyl layer sheets*

The fruits were packed in Bruce boxes and stored under atmospheric conditions in a cement block building. Packages containing diphenyl and those without were held in identical but separate rooms. Records of the amount of decay were taken at weekly intervals for three weeks from the date of picking.

In addition to the above mentioned treatments, a series of twenty tests were run in which oranges were held in diphenyl boxliners for one week and then removed to ordinary Bruce boxes. This was to simulate conditions that might obtain in commercial marketing.

Diphenyl wraps for this investigation, furnished by the Crown Paper

*In this article "diphenyl boxliners" refers to large paper sacks holding 4/5 bushel and each of such dimensions that two of them can be placed side by side in a 1 3/5 bushel Bruce box. Four flaps at the top are folded over the fruits to make a fairly tight container. The layer sheets of the same impregnated paper, 12x12 inches, are placed approximately in the middle of the pack.

Company of Sanford, Florida, were rated to contain approximately 30 milligrams of the chemical per wrap, while diphenyl boxliners and layer sheets rated to contain five pounds of diphenyl per ream were supplied by the Weathers Packaging Service of Orlando, Florida. The generous cooperation of both these companies in this work is here acknowledged.

A rough calculation from the above figures gives, for a box containing 200 oranges, 6 grams of diphenyl or 30 mgs. per fruit in the case of the wraps and 16.5 grams or 82.5 mgs. per fruit where diphenyl boxliners plus two layer sheets were used. In this connection, it should be stated that great care was taken to keep all supplies of diphenyl wraps, boxliners, etc., tightly wrapped in parafined paper until used to prevent loss of the chemical by vaporization.

The number of fruits used in an individual test varied somewhat with the size of fruits; for oranges the average number was about 100 and for grapefruit from 45 to 55. For each variety of oranges therefore, with four treatments and eight replications throughout the season, about 3200 fruits were involved and for grapefruit about one-half that number. In all, over 20,000 citrus fruits were used in this study.

The periods during which fruits of the different varieties were picked for the experiments here described are given below and since, as before mentioned, storage was under atmospheric conditions, the temperature variation is also recorded.

data collected in this investigation, it does not seem desirable in the present article to give them in full. Therefore, aside from one typical experiment, only the mean or average

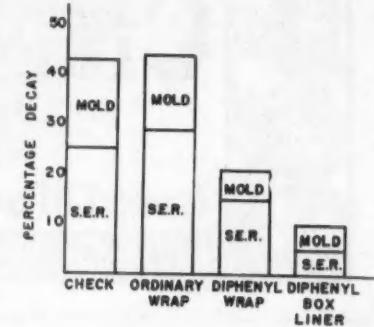


Figure 1. Reduction of decay in citrus fruits by the use of diphenyl. Standard Series after three weeks in storage. S. E. R.—Stem-end Rot.

values for each variety and the averages for all experiments are shown together with the least differences necessary for significance which were obtained from the statistical analysis. A complete record of the experimental work is on file with the Citrus Commission at Lakeland, Florida, and at the Citrus Experiment Station, Lake Alfred, Florida.

Standard Series. This includes the four treatments previously mentioned. The results are given in Table 1 for both two and three weeks from the time of picking. Based on the two weeks record, it is evident that there was excellent reduction of stem-end rot and of molds in both diphenyl wraps and in the diphenyl box liners when compared with the

| Varieties | Period covered by tests | Temperature | | |
|----------------------|-------------------------|-------------|---------|------|
| | | Minimum | Maximum | Mean |
| Seedy Grapefruit | October 16, 1946 to | | | |
| Hamlin Oranges | January 14, 1947 | 62 | 89 | 79 |
| Parson Brown Oranges | | | | |
| Seedless Grapefruit | November 25, 1946 to | | | |
| Pineapple Oranges | February 24, 1947 | 54 | 89 | 75 |
| Valencia | January 28, 1947 to | | | |
| Oranges | April 8, 1947 | 54 | 89 | 75 |

Detailed records of the relative humidity were not kept but over the entire period of the investigation it varied from 60 per cent to 90 per cent with a mean value of 75 per cent. Under these conditions all fruits wrapped or unwrapped or in box liners showed no appreciable shrinkage during the three weeks of storage and aside from decay remained firm and in good condition. Statistical analysis of the entire series of experiments was made using Fisher's analysis of variance method.

Results

Because of the large amount of

unwrapped checks and fruits in ordinary wraps which contained no diphenyl. At the end of three weeks the diphenyl boxliners were definitely better than the diphenyl wraps as regards stem-end rot but no better in respect to mold. This was probably due, as discussed under "Methods" to the heavier load of diphenyl in the paper from which the box liners and layer sheets are made than was present in the diphenyl wraps. The average values for three weeks storage are shown in Figure 1 in the form of a graph.

While in the data as shown in

Table 1 and Figure 1 results for experiments in which the fruits were gassed with ethylene are not shown separately, it was true, as is usually the case, that the ethylene treated samples showed more decay because of a stimulating effect on stem-end rot. Also the degree of control was not so good as shown by the following average of total decay in per cent three weeks from picking:

| | Checks | Diphenyl Wraps | Diphenyl Boxliner |
|---------------|--------|----------------|-------------------|
| Plus Ethylene | 46 | 26 | 13 |
| No Ethylene | 39 | 16 | 6 |

Incidental to the effect of diphenyl, it may be worth while to point out that these data show ordinary wraps containing no diphenyl to have practically no effect on decay either as regards stem-end rot or mold when compared with unwrapped fruits. The first few experiments seemed to indicate a higher amount of stem-end rot when wraps were used and

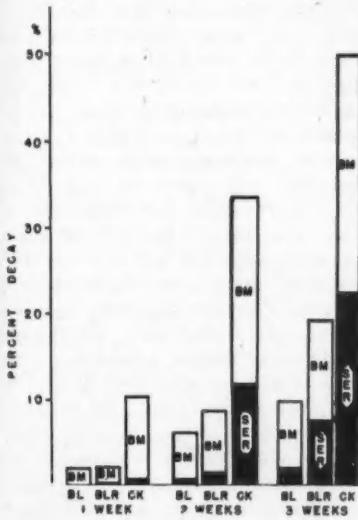


Figure 2. Effect of storage for one week in diphenyl boxliners, average of twenty tests. BL—in boxliner throughout storage; BLR—removed from boxliner at the end of one week; CK=check.

The average values for all experiments does show a slightly higher value which, however, is only on the border line of significance at the 5 per cent level. Conversely, mold in wrapped fruits shows a lower percentage than the unwrapped checks. The difference in this case has no significance even at the 5 per cent level. The latter result is mentioned because of the common belief that ordinary wraps are of

Table 1. Showing the reduction of decay in citrus fruits by the use of diphenyl. Standard series.

| | STEM-END ROT % | | | BLUE MOLD % | | | TOTAL LOSS % | | |
|---------------------|----------------|-------|-------|-------------|-------|-------|--------------|-------|-------|
| | 2 Weeks | | | 3 Weeks | | | 2 Weeks | | |
| | Check* | DPW.* | DPL.* | Check* | DPW.* | DPL.* | Check* | DPW.* | DPL.* |
| Seedless Grapefruit | 9 | 11 | 3 | 20 | 21 | 11 | 3 | 12 | 8 |
| Seedless Grapefruit | 6 | 4 | 1 | 14 | 12 | 4 | 5 | 7 | 4 |
| Hamlin Orange | 24 | 28 | 6 | 2 | 38 | 46 | 9 | 14 | 10 |
| Hamlin Orange | 27 | 29 | 6 | 2 | 38 | 42 | 10 | 11 | 8 |
| Pineapple Orange | 16 | 18 | 4 | 1 | 27 | 32 | 14 | 21 | 20 |
| Valencia Orange | 8 | 9 | 3 | 1 | 15 | 19 | 9 | 3 | 26 |
| Average 48 Tests | 15 | 17 | 4 | 1 | 25 | 29 | 15 | 14 | 12 |
| LDNS* | | | | | | | 3.4 | 2.6 | 3.0 |

* Check, no wraps.
RW, regular wraps
DPW, diphenyl wraps
DPL, diphenyl boxliners
LDNS, least difference necessary for significance between averages of all 48 tests at the 5% level.

value in preventing the spread of mold from one fruit to another giving rise to a condition known as "nesting." Over a period of a number of years and the observation of thousands of lots of fruits, the authors have noted very few cases that might be attributed to such spreading of infection and the present results appear to point the same way. A plausible explanation is that practically all the mold infections in Florida fruits are caused by the common green mold, *Penicillium digitatum* (Fawcett, H. S., *Citrus Diseases and Their Control*, New York, 1936) which does not tend to spread by contact.

The data for one typical experiment (DP-37) are shown in Table 2. Pineapple oranges picked on January 23, 1947 were used and no ethylene treatment was given. Besides the four regular items two others

mold infections, much stem-end rot was found in the untreated lots which resulted in a loss of approximately one-half of the original number of oranges. At the same time all the diphenyl treatments showed good control. This is true even of lot No. 5 which had been removed from the diphenyl box liner at the end of the first week. After three weeks there was still good control in treated lots especially No. 4. The small amount of diphenyl vapor in the storage room with the treated samples had no effect on decay (No. 6).

Diphenyl treatment for one week. This item was introduced into the series of experiments some time after the work was started. However, twenty such tests were run on Hamlin, Parson Brown, Pineapple and Valencia oranges both gassed with ethylene and ungassed. As before

ther advantage is that much of the diphenyl vapors absorbed by the fruit will be removed before ultimate consumption. In this connection, we wish to point out that these lots of fruits were all held at relatively high atmospheric temperatures in Florida. (See temperature records). During the colder months of the citrus season, shipments to northern markets will be under lower average temperatures during the marketing period. Under these conditions it is possible even better control of decay will result from this method than is shown by our data. Experimental work along this line will be undertaken.

Diphenyl taste in treated fruits. It is known that diphenyl is absorbed in citrus fruit in small amounts (10) but according to Macintosh (7), experiments show that the chemical has a low toxicity and the use of wraps impregnated with it constitutes no danger to the consumer. However, one criticism of the use of diphenyl is that an "off" taste is imparted to citrus fruits by this small amount of the chemical. Not only that, but it is said the odors are absorbed by other foods stored in iceboxes with diphenyl treated fruits (personal communications from workers in Palestine). For this reason a series of tests was made in an attempt to determine the extent of this effect. "Blindfold" tests were set up in which the taster did not know which were the diphenyl samples. In testing juice, oranges or grapefruit were kept in diphenyl boxliners for one week when tests were made directly on removal from the package. The remaining fruit was then held several days away from the diphenyl at which time other tests were made. The results of these experiments are summarized in Table 3.

While these tests are not extensive, there is no doubt that diphenyl imparts a noticeable taste to juice of oranges stored in diphenyl containers. However, none of those tasting described the slight flavor of diphenyl in the juice as disagreeable and also, when the fruit had been aerated a few days before tasting, the diphenyl flavor was less marked than when sampled immediately after removal from the container.

To check on the matter of absorption of the chemical by other foods in the proximity of diphenyl treated fruits, butter was placed in a household refrigerator with oranges which had been in a diphenyl box-

Table 2. Results of a typical experiment (DP-37) showing the action of diphenyl in reducing decay in Pineapple oranges. Fruit picked January 23, 1947. No ethylene coloring treatment.

| No. | Treatment | No of Fruits | 1 week storage | | | 2 weeks storage | | | 3 weeks storage | | |
|-----|--------------|--------------|----------------|--------|---------|-----------------|--------|---------|-----------------|--------|---------|
| | | | Ser % | Mold % | T. L. % | Ser % | Mold % | T. L. % | Ser % | Mold % | T. L. % |
| 1 | Check | | | | | | | | | | |
| | Unwrapped | 104 | 0 | 19.2 | 19.2 | 15.4 | 34.6 | 50.0 | 22.1 | 37.5 | 59.6 |
| 2 | Ordinary | | | | | | | | | | |
| | Wraps | 96 | 0 | 11.5 | 11.5 | 15.6 | 29.2 | 44.8 | 25.0 | 30.2 | 55.2 |
| 3 | Diphenyl | | | | | | | | | | |
| | Wraps | 81 | 0 | 0 | 0 | 3.7 | 4.9 | 8.6 | 8.6 | 5.0 | 13.6 |
| 4 | Diphenyl box | | | | | | | | | | |
| | liner | 94 | 0 | 0 | 0 | 0 | 2.1 | 2.1 | 1.1 | 2.2 | 3.3 |
| 5 | Diphenyl box | | | | | | | | | | |
| | liner 1 week | | | | | | | | | | |
| | only | 86 | 0 | 1.2 | 1.2 | 1.2 | 4.7 | 5.8 | 4.7 | 5.8 | 10.5 |
| 6 | Check in | | | | | | | | | | |
| | "Diphenyl | | | | | | | | | | |
| | room" | 104 | 0 | 16.3 | 16.3 | 17.3 | 29.8 | 47.1 | 22.1 | 35.6 | 58.7 |

were included; viz. No. 5, in which the oranges were held in a diphenyl boxliner for one week and then removed to a regular Bruce box and No. 6, an extra check lot, which was placed in the same room with lots treated with diphenyl. The object of the latter was to see if the vapors of diphenyl in this room might have some value in reducing decay.

In this particular experiment as shown in Table 2, several interesting things are evident. At the end of the first week of storage, the oranges developed no stem-end rot but had a relatively high percentage of mold as shown by the lots without diphenyl (Nos. 1, 2 and 6). Protection against mold in this period is shown both by diphenyl wraps and diphenyl box liners (Nos. 3, 4 and 5). At the end of two weeks, in addition to a marked increase in

mentioned, fruits were held in diphenyl boxliners for one week to approximate the time period in commercial handling from picking to arrival at retail markets and then removed to ordinary boxes without diphenyl for the remaining two weeks of holding. The average results of these twenty holding tests are presented graphically in Figure 2.

At the end of one week, of course, both diphenyl treatments are the same and, as would be expected, the effect on decay, principally mold, is the same. During the second and third week of storage the effect of removing the fruits from the diphenyl package is evident, although the contrast with the check lots is still very striking. Therefore, considerable economic saving by this procedure appears possible. A fur-

liner for one week. The check sample consisted of butter sealed tightly in a Mason fruit jar. On opening the refrigerator after two days, a distinct odor of diphenyl was noted. In two blindfold tests made, all persons (seven in one case and eight in another) detected diphenyl in the butter and here the opinion was that the taste was disagreeable. However, it was found necessary to place the butter almost in contact with the oranges to obtain positive tests. Neither the slight taste imparted to the juice nor the chances of absorption by other foods appears to the writers to be serious objections to the use of diphenyl.

Tangerines. Experiments on the diphenyl treatment of tangerines were not satisfactory. This was undoubtedly due to the poor condition

such bags with a diphenyl load of two and one half pounds per ream, the average of three experiments showed 50 per cent total decay in the checks and 41 per cent in the treated samples.

This experience we feel brings out the importance of the concentration of diphenyl in this procedure. When boxliners, which are essentially paper bags containing five pounds of diphenyl per ream, were used as in our standard series described above, excellent control of decay resulted. It seems true also that the smaller amount of diphenyl in diphenyl wraps will account for their somewhat smaller percentage of control of stem-end rot than the box liners

Summary

A comprehensive series of tests on the use of diphenyl for the prevention of stem-end rots and molds

application of impregnated wrappers against fungal decay in citrus fruit. Hadar 11: 261-267. 1938.

(3) Farkas, A. Control of wastage of citrus fruit by impregnated wrappers on a commercial scale. Hadar 12: 227-231. 1939.

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FERTILIZER PRICES LOW COMPARED WITH OTHER COMMODITIES

Table 3. Taste tests on juice from Diphenyl treated fruit.

| No. | Variety | Conditions | No. Persons Tasting | No. Detecting Diphenyl |
|-----|-------------------|---------------------------------------|---------------------|------------------------|
| 1. | Hamlin oranges | Directly on removal from DP boxliners | 8 | 8 |
| 2. | Hamlin oranges | After 3 days out of boxliners | 6 | 5 |
| 3. | Pineapple oranges | Directly on removal from DP boxliners | 6 | 5 |
| 4. | Pineapple oranges | After 3 days out of boxliner | 6 | 5 |
| 5. | Marsh Grapefruit | Directly from DP boxliner | 5 | 1 |
| 6. | Marsh Grapefruit | After 2 days out of boxliner | 5 | 1 |
| 7. | Pineapple oranges | Directly from DP boxliner | 5 | 4 |
| 8. | Pineapple oranges | After 2 days out of boxliner | 5 | 0 |

of the tangerine crop this particular season with stem-end rot infections already initiated at the time of harvest. For example, in one experiment on ethylene treated fruits from 42 per cent to 48 per cent of stem-end rot was recorded after only one week in storage and no reduction was brought about by diphenyl, at two weeks the samples had to be discarded. In ungassed fruits diphenyl reduced total decay 50 per cent but at three weeks all samples were in bad shape. After a number of such trials no more experiments were made.

Diphenyl bags. These were heavy walled paper sacks with an inner paper lining impregnated with diphenyl and were designed to constitute a shipping package as such. The capacity was 4/5 bushel and the lining was rated to contain one pound of diphenyl per ream. No control of decay was found from the use of these bags. Later, using

in a number of varieties of citrus fruits is described. Diphenyl wraps and diphenyl boxliners were found to greatly reduce both stem-end rot and mold when compared with unwrapped checks and fruits in ordinary wraps. Diphenyl boxliners gave better control of stem-end rot than the wraps but were no better in respect to mold. This is considered to be due to the greater amount of diphenyl available in the former package. Failure to obtain good control in diphenyl bags containing smaller amounts of the chemical than the above liners points in the same direction. Oranges kept in diphenyl boxliners for one week and then removed still showed enough less decay than the checks at the end of three weeks to constitute a good degree of control.

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- (1) Anonymous. Diphenyl citrus wraps. Citrus 6: 11:14. 1944.
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An investigation of the fertilizer industry, such as has been proposed by Rep. Sabath of Illinois, would show that fertilizer prices today are only 35 per cent above the 1935-39 average, as compared with an increase of more than 100 per cent in commodity prices generally, Maurice H. Lockwood, president of The National Fertilizer Association stated recently.

"Government figures show that the increase in fertilizer prices over the pre-war level is substantially less than the increase in raw material and wage costs during the period," Lockwood said.

"Fertilizer is just about the cheapest commodity the farmer buys."

A new home demonstration club was formed in Bradenton recently, according to Mrs. Annie D. Davis, Manatee County home demonstration agent.

Trends In The Processing Industry¹

H. G. HAMILTON, Professor
Of Marketing, Agricultural Experiment Station

I want briefly to compare the importance of the processing industry with the fresh, to show the trend in the per capita pack of citrus juices, to show that these trends are encouraging, to compare the cost of marketing processed products with fresh, to show the importance of expanding the processed segment market, and last, to suggest four problems that need study.

The Importance of the Processed Product as Compared With The Fresh

Beginning with 1923 a part of the Florida grapefruit crop was marketed in processed form. Since that time the per cent of the total grapefruit crop that has been marketed in fresh form has decreased, until in the 1945-46 season it amounted to only 30 per cent of the total. In the 1931-32 season 90 per cent of the crop was marketed fresh. Figure 1. Since the 1931-32 seasons the per cent of the Florida crop marketed in fresh form has decreased at the approximate rate of 4 per cent per year. In the 1931-32 season 96 per cent of the Texas grapefruit crop was marketed in fresh form. From 1931-32 to 1945-46 the per cent of the Texas crop marketed in fresh form decreased at the approximate rate of 2 per cent per year. From 1939-40 to 1945-46 there was no decrease in per cent of the Texas crop marketed in fresh form; but during the same period the per cent of the Florida crop marketed fresh continued to decrease. It is probable, because of the sectionizing qualities of the Florida fruit, that the percentage going to process use may continue to increase.

Approximately 93 per cent of the California oranges were used in fresh form from 1929-30 to 1935-36, and from 1936-37 to 1945-46 approximately 83 per cent was marketed in fresh form. Figure 1. From 1929-30 to 1938-39 approximately 95 per cent of the Florida oranges were marketed in fresh form. From 1938-39 to 1945-47 the per cent of Florida oranges marketed in fresh form decreased from 95 per cent to less than 60 per cent. This is a decrease of 4 per cent per year.

The United States grapefruit crop

ed form. During this period fresh marketing of oranges almost doubled while processed marketing increased twelvefold. Figure 2.

Per Capita Pack of Citrus Juices

There are four important citrus fruit products. They are: grapefruit sections, grapefruit juice, orange juice and blended juice. The per

in the 1935-36 season amounted to 16½ million boxes, of which 12 million boxes were marketed in fresh form and about 4½ million in processed form. Production increased

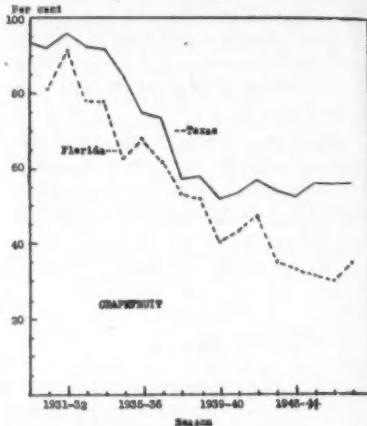
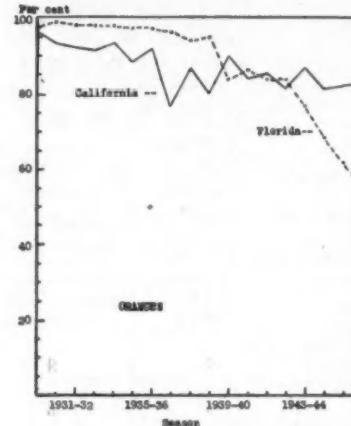


Figure 1. Per Cent of The Total Grapefruit and Orange Crop Marketed in Fresh Form.

from year to year until in 1945-46 there were approximately 26 million boxes marketed in fresh form and 35 million boxes marketed in processed form. Thus during this period the fresh marketing doubled and processed marketing increased

from year to year until in 1945-46 there were approximately 26 million boxes marketed in fresh form and 35 million boxes marketed in processed form. Thus during this period the fresh marketing doubled and processed marketing increased

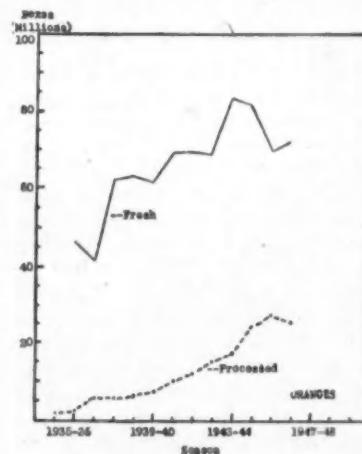


Figure 2. United States Oranges and Grapefruit Used in Fresh and Processed Form.

eightfold. Figure 2. In 1935-36 approximately 45 million boxes of oranges were marketed in fresh form and only about 2 million boxes in processed form. In 1944-45 approximately 81 million boxes of oranges were marketed in fresh form and approximately 25 million in processed

of grapefruit increased at the rate of 1.3 pounds per year. In the case of orange juice, the per capita pack per year did not reach a half pound until 1938-39. From 1938-39 the per capita pack increased from approximately 1 pound to approximately 6 pounds. This was an average in

¹ Given before the Citrus Institute at Camp McQuarrie, August 27th, 1947.

October, 1947

THE CITRUS INDUSTRY

Eleven

crease per year of three-fourths of a pound per capita. The production of blended juice was only one-half-pound per capita in 1940-41, but increased to approximately 3 pounds by 1945-46. The rate of increase in per capita production of blended juice has been somewhat more rapid than in the case of grapefruit juice, but less rapid than in the case of orange juice. The dots in Figure 3 show the per capita production for each year from 1929-30 to 1946-47. The trend line shows the approximate rate of increase. There have been few commodities

and for tomato juice and fruit juices other than citrus the pack was approximately 44 million cases. For 1946-47 the U. S. pack of citrus juices was slightly less than tomato juice and all other fruit juices. It will be observed in Figure 4 that the upward trend in per capita production of citrus juices is considerably greater than for juices other than citrus.

Trends Are Encouraging

These trends are interesting and I believe, on the whole, encouraging. Diets of the people of the world vary greatly, depending upon the in-

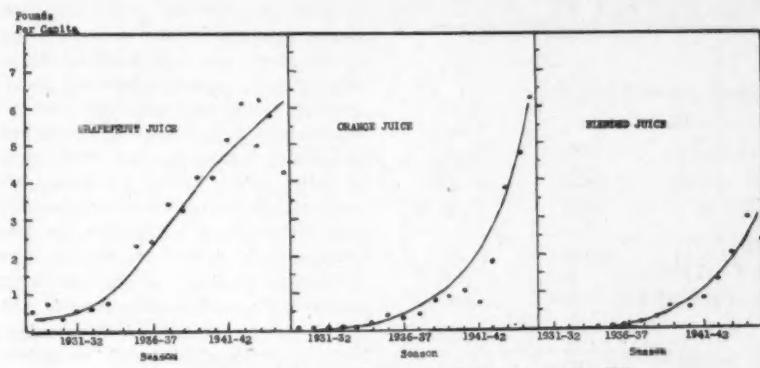


Figure 3. United States Per Capita Pack of Citrus Juices 1929 to 1946.

in which the per capita production has increased as rapidly as that of citrus processed products.

The per capita pack of citrus juices seems small, but the aggregate pack of 50 to 60 million cases is a very impressive figure. In Figure 4 is shown the U. S. pack of all citrus juices, and tomato juice and all fruit juices other than citrus fruit juices. It will be observed that in 1936-37 the U. S. pack of citrus juices was less than 10 million 24/2 equivalent cases, but for tomato juice and fruit juices other than citrus the U. S. pack was approximately 25 million cases, or 2½ times that of citrus juices. In 1945-46 the pack of citrus juices was slightly in excess of 60 million cases,

comes and the pressure of the population of a nation upon the land. In China and India where the pressure of the population is very great upon the land, the diet of the people is almost exclusively rice and other starchy foods. Animal products and fruits make up a very small part of the diets of these people. In a country like the United States, the diets of people vary greatly because of variation in their income. The people with high incomes consume relatively large quantities of meat and fruit. The per capita consumption of people with high incomes often is several times as great for such commodities as fruits and high quality cuts of meat as people with low incomes. Perhaps the per capita consumption of processed citrus fruit juices for high income people is as much as 40 or 50 pounds per year, while for low income people it may be less than 3 pounds per capita. No one can foresee the changes that may take place in the diets of people during the next few years. In 1910 when the per capita consumption of apples in fresh form was approximately 80 pounds and the per capita consumption of all citrus fruit less than 20 pounds no one foresaw the changes which

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have taken place, in which the per capita consumption of citrus fruit in fresh form is today about 80 pounds and that of apples 30 to 40 pounds. It is probable that the saturation point has not been reached in the consumption of citrus fruits, either in fresh or processed form.

Comparison of Cost of Marketing

Fresh and Processed Products

Cost data have not been analyzed at all the levels of trade. In Florida we have computed the cost of pack-

the retail price represents the marketing margins, which include not only the packing or processing but marketing costs of the retailer and the wholesaler as well as cost of transportation. For the year 1946 these data are shown for grapefruit in Table 2.

It will be observed that the margins per box of grapefruit in fresh form was \$3.36, while the margins per case of 24/2's for grapefruit juice was \$2.43. This was \$0.93 in favor of the processed product.

ly 1½ pounds, and apples about 1½ pounds.

The pack of citrus fruit and fruits other than citrus, and citrus juices and fruit juices other than citrus juices is given for the seasons 1944-45 to 1946-47, inclusive, in Table 3. During these three seasons citrus juice pack averaged slightly more than the pack of other fruit and vegetable juices, but the pack of citrus fruit (that is sections) averaged only about 3 per cent of the U. S. pack of fruit.

It is believed that the per capita consumption of citrus fruit segments of both oranges and grapefruit may reach the per capita consumption of peaches and pineapples. However, this cannot be done at once, nor can it be done until the cost of processing citrus in segment form has been decreased. The reduction of labor costs by 50 per cent for sectionizing oranges and grapefruit may be possible. Whether or not consumers will accept orange and grapefruit sections on a par with peaches, pineapples and pears is not known. However, should the sectionized citrus product meet consumer demand on the par with peaches, pineapples and pears, a market for approximately 50 to 60 million boxes of oranges and grapefruit would result. Because the sectionized product is used for deserts and salads it perhaps would not displace to any extent the citrus juices and fresh fruit consumption.

Because the cost of marketing the processed juices is decidedly lower than the fresh product, and that of sections perhaps somewhat lower, it is probable that any expansion in the European market will be in processed form. Furthermore, the processed product, because of its lower price to consumers for equivalent food values would likely fare better in times of a depression than the fresh product.

Table 1. Comparison of the Cost of Handling Processed Citrus Fruit With The Cost of Handling Fresh Citrus Fruit /1 /2.

| Number of Firms | Orange Juice Per 12/404 Case | Fresh Oranges Per 1-3/5 Bruce Box | Grapefruit Juice Per 12/404 Case | Fresh Grape- fruit Per 1-3/5 Bruce Box |
|--|------------------------------------|---|--|--|
| 19 | 19 | 67 | 22 | 64 |
| Items of Expense: | | | | |
| Materials | \$0.5580 | \$0.3454 | \$0.5585 | \$0.3405 |
| Labor | .1477 | .1994 | .1660 | .1645 |
| Other | .1439 | .0972 | .1719 | .0738 |
| General Administrative and Selling* | .1348 | .1653 | .1405 | .1639 |
| Total | \$0.9844 | \$0.8073 | \$1.0369 | \$0.7427 |

/1 Because the orange juice firms are not the same in all cases as the grapefruit juice firms, the difference in costs for the two products is greater than when identical firms are used.

*Brokerage and discounts and allowances, which amounted to approximately \$0.20 per case for orange juice and \$0.13 per case for grapefruit juice, have been excluded to make comparable with fresh selling cost.

/2 Source: H. G. Hamilton and J. K. Samuels. Cost of Handling Florida Citrus Fruit in Processed and Fresh Form, 1944-45 Season.

ing citrus juices and packing fresh fruit. For the 1944-45 season the average cost of 19 firms for canning, selling, (excluding brokerage) and warehousing a case (12/404) of orange juice was \$.98. The average cost of 67 firms for packing and selling oranges in Bruce boxes was \$.81. The cost of canning, selling, and warehousing grapefruit juice for 22 firms was \$1.03, and of packing and selling grapefruit in Bruce boxes the cost was \$.74 per box for 64 firms. For comparable quantities it appears that the cost of packing fresh oranges is approximately 20 per cent less than processing orange juice. In the case of grapefruit the cost of packing is approximately 25 per cent less than for processing the same quantity in juice. Table 1.

The Bureau of Agricultural Economics of the U. S. Department of Agriculture compiles the retail price of grapefruit in fresh form and in processed form each month, and the farm value for grapefruit in fresh form and processed form. The difference between the farm price and

Grapefruit and Orange Segments

The pack of citrus fruit, that is the segments, amounted to only 5 per cent of the total U. S. pack of all fruits in 1946. The per capita pack of peaches, pineapples, pears, apples, and grapefruit is shown in Figure 5 by years from 1929 to 1946. The per capita pack of peaches exceeds that of any other fruit product. Following peaches are pineapples, pears and apples. The per

Table 2. Comparison of Prices and Marketing Margins for Fresh Grapefruit and Processed Grapefruit for the Calendar Year 1946.

| | Per Box | Per Case of 24/2's |
|---------------------------|---------|--------------------|
| Retail Price to Consumers | \$5.40 | \$3.55 |
| Farm Value | 2.04 | 1.12/1 |
| Margins | \$3.36 | \$2.43 |

Source: Adapted from Price Spreads Between Farmers and Consumers for Food Products — Supplement.

capita pack of peaches in 1946 was a little over 6 pounds; in 1929 the per capita pack was 3½ pounds. The per capita pack of pineapples from 1929 to 1945 fluctuated erratically, but averaged approximately 3½ pounds. Pears averaged approximate-

Other Citrus Products

There are many other citrus products such as pulp for cattle feed, pectins, molasses, oils, marmalades and candies, all of which are increasing in importance. New products appear each year. Some of these pro-

ducts hardly pay production costs. However, their production will continue because pulp from processing of juices can best be disposed of through these products.

Four Problems That Need Study

There are many problems in the processing industry that need study, but I would like to direct your attention to four which to me stand out. The first problem is to lower the cost of processing and marketing. In 1944-45, out of 25 firms studied one processor had a cost of only 82 per cent of the average, while another processor had costs 57 per cent higher than the average. This means that the most efficient firm was operating at about one-half the cost of the least efficient. Where such wide variation in costs exists the indications are that much can be done to lower costs. Because other marketing costs are greater than processing cost, it is even more important that these costs be lowered, particularly retailing. The good thing about lowering cost is that it can be done without waiting for the industry as a whole to act. Each firm can act independently of other firms. Another good thing about lowering cost is that the benefits accrue first to the party responsible for lowering the cost and then spreads out to the entire industry.

The second problem is to push the production of sectionized products because this product is not likely to displace the consumption of citrus in fresh form or processed fruits. In our opinion it is easier to crack the "desert market" now held by peaches, pineapples and pears, than it is the soft drink market. Of course our efforts to capture a part of the soft drink market should be continued.

The third problem is to obtain a more uniform processed product. Usually, processed products are more uniform in quality than fresh products. I am not sure that this is true in the case of citrus processed products. It has been suggested that greater uniformity might be obtained by slightly concentrating the juice produced earlier in the season so as to increase the solids. It has also been suggested that uniformity might be obtained by the mixing of juices produced earlier in the year with those produced later in the year. Obviously, some problems of production and cooking are involved here. How uniformity of processed product is to be obtained I do not know. The industry is cognizant of the necessity of greater uniformity

of quality and I shall be surprised if much headway is not made within the next few years. It has been repeatedly pointed out that "average good quality" is not sufficient. When some of the product is 25 per cent below good quality and some of

the product is 25 per cent above good quality many problems result. First, demand is affected tremendously; second, advertising is less effective; and third, prices are beat down.

The fourth problem is to find some

Quality Fruit...

**The Citrus Grower
is the backbone of the
rapidly expanding
Florida citrus industry.
His job is to supply
the consumer and processor
with a product of
uniformly high quality.**

**NACO 5-STAR BRAND fertilizers,
with their balanced ration
of essential minerals,
in addition to the
primary plant foods,
have helped the Grower
produce quality fruit
since 1926!**



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way whereby the processor can shift his price risk. I know of no industry for its size where the entrepreneur is subject to such great losses from price changes as the citrus processor. The practice of selling and guaranteeing the pur-

ity of future prices. Where there is a well organized futures market for a commodity, purchasers may hedge their operations against price changes. At the beginning of the season or at any other time, but particularly at the beginning of the

commodity that would lend itself to future trading. The matter should be thoroughly studied to determine whether it would be desirable for the industry to have an organized market for citrus fruit juice. If it is found desirable the problem of how to institute futures trading should be studied.

In addition to enabling the processor to protect himself against losses because of price changes, a futures market would have the advantage of registering on any given day the combined opinion of growers, processors and wholesalers as to what price of citrus fruits would be from 1 to 6 months in the future.

I want to make it clear here that I am not advocating a futures market for citrus juices; but I also want to point out that some way should be provided whereby the canner can get out from under his load of

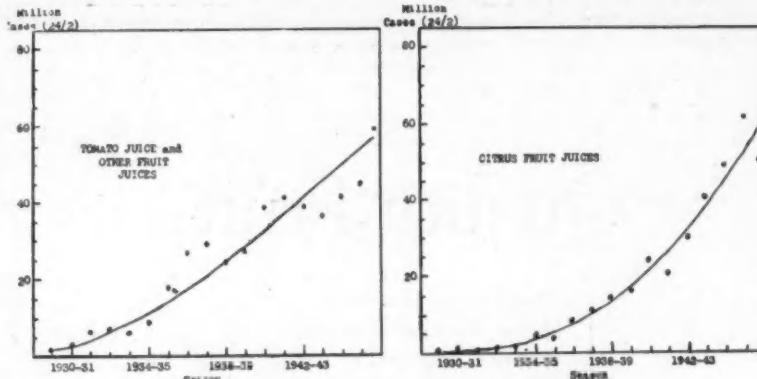


Figure 4. United States Pack of Citrus Juices, and Tomato Juices and Other Fruit Juices.

chaser against price decline, together with the very great uncertainty of future prices, is one of the major problems that the processors in the state are confronted with. It is probable that a closer coordinated sales organization than exists at the present time would help, but this alone, would not solve the problem. Perhaps there is no solution to the uncertainty of the price that a processor will be able to secure for his product at the time he makes the purchase from the grower. In a few cases I un-

season, when there is so much difficulty in establishing the price of cannery fruit, purchasers could buy with much more safety if at the time they purchase a crop of fruit they could turn around and sell a futures contract in a futures market. A discussion of the mechanics of handling the hedging operation would require more time than is at my disposal. Suffice it to say that flour manufacturers, feed manufacturers, textile manufacturers, and many other firms are able to protect themselves against losses from price changes

Table 3. Annual Pack of U. S. Fruits, and U. S. Fruit and Vegetable Juices.

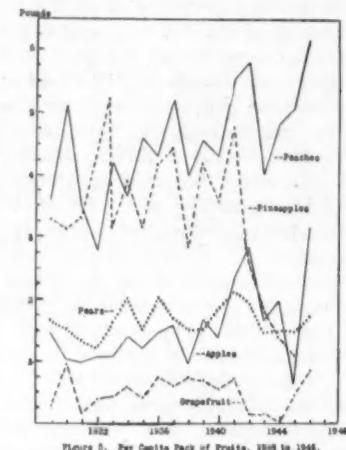
| Season | Citrus | Other Than Citrus | Per Cent Citrus is of Total |
|---|--------|-------------------|-----------------------------|
| U. S. Fruits (Thousand Cases) No. 2-1/2 Can Basis | | | |
| 1944-45 | 457 | 55,492 | 0.8 |
| 1945-46 | 2,128 | 49,579 | 4.1 |
| 1946-47 | 4,000 | 78,139 | 4.9 |
| U. S. Fruit and Vegetable Juices (Thousand Cases) No. 2 Can Basis | | | |
| 1944-45 | 47,970 | 48,954 | 49.5 |
| 1945-46 | 62,944 | 45,856 | 57.8 |
| 1946-47 | 50,000 | 59,419 | 45.7 |

Source: Adapted from Industry Report, Canned Fruits and Vegetables, May, 1947, U. S. Department of Commerce.

derstand that packers pack only on order. In most cases there is a period of from 30 days to 6 months between the time that the canner purchases the fruit from the grower and the time that he disposes of the product. The canner needs some method whereby he may hedge against falling prices. There are people in the industry who believe that a good futures market on a well organized commodity exchange would be the answer to the canners' problem of the uncertain-

from the time they purchase the raw product until they can dispose of the finished product for such commodities as cotton, wheat, corn, oats, sugar and hides.

Granting that it is desirable to have a futures market, it should be understood that not all commodities are adapted to future trading. The problem of a futures market for citrus juices has been considered by some of the commodity exchanges. There is a difference of opinion as to whether or not citrus juice is a



heavy price risk. I am proposing that the matter of a futures market for citrus juices be studied to see if it is desirable for the industry as a whole.

Furthermore, it should be pointed out that futures trading in juices does not have to depend on what the Florida citrus industry thinks about it. It certainly could be started on any number of commodity exchanges at any time. The problem needs studying, and if futures trading is the solution to price risk, then give it a boost. If it is not the solution, then provide some other method.

If some method of reducing price risk cannot be devised we may have in the citrus industry what is in use with many canning crops such as peas, kraut, and tomatoes.

(Continued on page 18)

NOTES OF THE TRADE

DR. FUDGE JOINS
FERTILIZER COMPANY

B. R. Fudge, Ph. D., who for the past 18 years has been associate bio-chemist of the Citrus Experiment Station of the University of Florida, has been appointed horticulturist for the Wilson and Toomer Fertilizer Company with home offices in Jacksonville, Florida, according to a re-



cent announcement by the firm's president, J. Albert Woods. Dr. Fudge succeeds the late Colonel B. F. Floyd, whose work for many years as horticulturist for this company was recognized throughout Florida.

In announcing the appointment, Woods pointed to Dr. Fudge's outstanding record of accomplishment in chemical research applied to agriculture and particularly to the citrus industry.

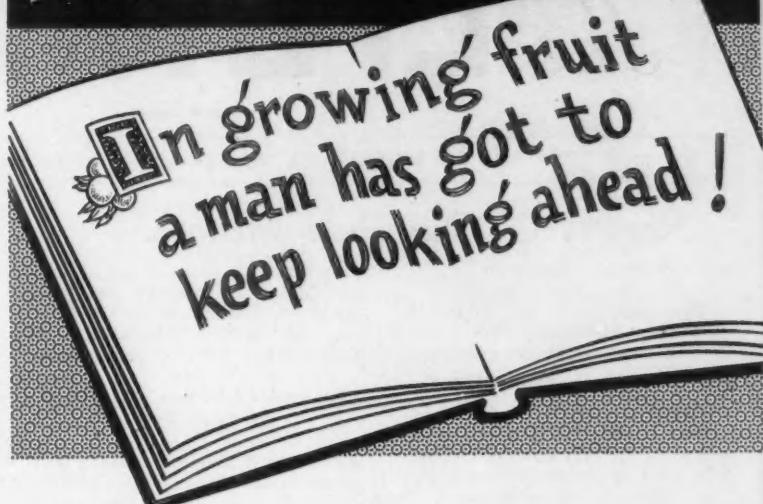
Dr. Fudge has written many important articles and papers on the results of his experiments on citrus nutritional problems, some of which have appeared in *The Citrus Industry*.

The Wilson and Toomer Fertilizer Company was established in 1893 and is considered to be one of Florida's leading industrial concerns. The firm manufactures sulphuric acid, superphosphate, mixed fertilizers and handles many other fertilizer materials.

Dr. Fudge was born in Rock Hill, S. C., attended public schools of that

(Continued on page 18)

TRUISMS of a Citrus Grower



The crop on your trees will soon be history. It's that way season after season, as long as you are in the business of growing fruit.

The NEXT crop needs your attention and planning now. It's there — in the life cycle of your trees.

Your program of tree care will be a big factor in whether or not you reach your goal of more QUALITY fruit . . . next year.

GULF-served growers look ahead with confidence because they know GULF Friendly Fertilizers and GULF Field Service are a dependable combination.

Keep looking ahead! GULF complete service will pay you more in the long run.

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Reports Of Our Field Men . . .

POLK COUNTY

J. M. (Jim) Sample

The hurricane of September 17th and 18th passed Polk County to the south doing no great damage. In the Winter Haven area, winds were recorded at 65 miles per hour in gusts with some winds probably higher not recorded. A check of several groves immediately after the winds revealed varying amounts of fruit on the ground with grapefruit generally averaging 3 to 5 per cent; oranges and tangerines were less than 1 per cent but some tangerines heavier where trees were pruned high and on those with heavier crops. A check on groves in the southern part of the county showed heavier damage, principally on grapefruit, with some losses estimated at 10 to 15 per cent. No estimate can be made now on the percentage of fruit bruised and thorn-pricked, some of which may drop later, and some of which will heal completely. Few trees were uprooted and these were the same ones set-up following uprootings in past storms. The foliage loss and wind burn is not serious and while the gusts of high winds buffeted the trees around considerably, there should be no permanent ill effect from this.

WEST CENTRAL FLORIDA

E. A. (Mac) McCartney

The recent hurricane gave everyone in this territory a scare but now that it has passed over and we have had an opportunity to check the damage we are glad to report that the loss to citrus is negligible. Of course a few grapefruit were blown off the trees but not enough to actually try an estimate in a percentage term. The excessive rains has caused some damage to both the citrus and vegetable growers, but with a few fair days we will forget about this and go forward with our Fall operations. We are getting our Fall application of fertilizer under way and I am glad to see our growers come in with this early application. There has been absolutely no activity shown on the part of fruit buyers, and it now looks like very little fruit will be sold before it is ready to move to mar-

ket. Scale insects are still active throughout the territory and growers have had to spray with oil for the second application to keep these pests under control.

NORTH CENTRAL FLORIDA

V. E. (Val) Bourland

We suffered only a very slight loss of fruit from the recent hurricane and our greatest setback was in the case of the vegetable grower where excessive rains has caused damage to seed beds and delayed the Fall plantings. Many of the packing houses are busy testing fruit and will get operations under way shortly after October 1. Fruit buyers that generally are very busy in the field at this time are conspicuous by their absence this Fall and we have not heard of any determined effort on the part of these men to get out and buy any large tonnage of fruit. We will get our Fall application of fertilizer applied to citrus groves somewhat earlier this year than in other seasons. Rust mite have been active and so has scale insects, but growers have been able to keep these pests under control and we have very little fruit showing signs of damage.

SOUTHWEST FLORIDA

Eaves Allison

Growers in this section have been fighting flooded fields since they started preparing their land for Fall planting and seed beds were badly damaged prior to the hurricane of middle September that was accompanied by heavy rains. With the hurricane rains practically everything was lost and the season will be greatly delayed. Most of the gladioli growers will not be so hard hit because there was only a small acreage planted and of course they still have their bulbs that can be planted at a later date. As far as our fruit losses are concerned we have some localities that were hard hit while other sections came through in good shape. The DeSoto County section was suffering from excessive rains before the hurricane, but now with the additional rains many groves are showing

serious damage from too much water. Fruit losses in this section were quite heavy with many old seedling trees being blown over and will be a total loss.

HILLSBOROUGH & PINELLAS COUNTIES

C. S. (Charlie) Little

We have completed a thorough check of this territory to determine just how much fruit and tree damage we actually had. From our observations and considering the opinions of others, we have come to the conclusion that our losses were not too severe. There is quite a few grapefruit on the ground, but we believe that 10 per cent would cover the loss on even the hardest hit groves. There is more grapefruit on the ground in Pinellas County than in Hillsborough. The orange loss as far as fruit blown from the trees is negligible. We had high winds and the trees were whipped around in good fashion so we know that we will have some additional droppage of both grapefruit and oranges as a result of thorn pricks and the general whipping around that it had to take. It is our opinion that we will have more damage from water than from wind.

SOUTH POLK, HIGHLANDS AND HARDEE COUNTIES

R. L. (Smokie) Padgett

The overall damage to the citrus crop in this territory by the recent hurricane is greater than was first estimated. Many growers with lakefront groves are reporting grapefruit on the ground as high as 25 to 40 per cent. Of course this is not the general case. Mr. Louis McLeod of the Keen Fruit Corporation, Frostproof, reports that some trees were blown over and in some exposed groves upwards of 20 per cent loss of grapefruit in the Frostproof area. Rains have been excessive and is doing considerable damage in some groves. Mr. Mark Smith a prominent citrus grower in the Hardee County area reports heavy damage to large seedling trees with many blown over or torn to pieces. Water is still standing in groves in the Hardee County section at this time (Sept. 23rd) and of course this will cause damage.

ADVERTISEMENT—LYONS FERTILIZER COMPANY



Never was a time we kin remember when growers in Florida was havin' such a hard time guessin' what sort of prices they was goin' to git for their fruit . . . here it is almost time when growers will start shippin' and if they is anyone who kin tell what sort of prices they is goin' to git we hain't heard of 'em . . . the growers know that their cost of production has gone up like everything else and figure that the consumer is goin' to have to pay a good price for the quality of fruit we'll put on the market.

Talked with a man the other day who has just got back from the North where he says oranges from another state is sellin' at 50 cents a dozen, with not a glass of juice in the whole dozen . . . what with buyin' power of the nation at its peak and with our fruit the best quality in years there ain't no excuse for our growers to sell, as they have in the past, for less than their cost of production . . . we believe that if the crop is handled right we ought to get good prices . . . before any of it is sold at some of the miserable prices we got last season, we hope the fruit will be destroyed.

Last month the Lyons Fertilizer Company urged folks to plan an early Fall application of fertilizer . . . and now that we've had a storm with a lot more heavy rain we feel that an early application is even more important . . . so we'd like to urge every grower to contact his fertilizer man and get some plant food to his trees just as early as it can be done.

Cording to experiments reported by the Department of Agriculture Citrus Products Station at Winter Haven much of the off-flavor that develops in processed orange juice, 'specially when stored in glass at room temperature, comes from fatty materials in the juice that is not removed in processin'. Filtered juice doesn't develop as much off-flavor as unfiltered juice . . . and peel oil may mask off-flavor but is responsible for little if any of it . . . cool storage prevents most of the injury to flavor in these juices.

The U. S. D. A. has recommended for consideration by the state councils for Arizona, California, Florida, Louisiana, Oregon, Texas and Virginia an acreage for winter vegetables in 1948 3 per cent less than that for the 1947 Winter season . . . the 291,945 acres recommended for the seventeen Winter vegetables is three per cent less than the acreage recommended for 1947, it is 5 per cent above the 277,940 acres harvested in 1947 . . . some of last year's planted acreage was lost on account of bad weather . . . the freeze got a lot of Winter vegetables . . . the crop was 1,270,400 tons or 11 per cent less than in 1946 . . . acreages recommended this year with average yields, would raise 6 per cent greater crops than in 1947 and 16 per cent more than the last ten year average.

Uncle Bill

NOTES OF THE TRADE

(Continued from page 15)

city and graduated from Clemson College in 1923. Immediately following his graduation he was appointed to a graduate research fellowship at the New Jersey Agricultural Experiment Station and began his graduate studies becoming State Legume Innoculant Inspector. He received his M. S. degree in 1925 and his Ph. D. two years later.

In 1927, he became State Plant Physiologist of New Jersey and held this position until 1929 when he accepted the position with the University of Florida Citrus Experiment Station.

FRANK D. JACKSON

Frank D. Jackson, head of the Jackson Grain Company at Tampa, died in a Tampa hospital on September 7 after a short illness.

Mr. Jackson had long been a leader in business, civic and religious circles in Tampa and South Florida. A director and leading spirit in Florida Southern College, he took an active interest in educational affairs.

As president of the Jackson Grain Company he was well known to many citrus growers with whom over a period of many years he had maintained business relations. He took a personal interest in citrus affairs and his company was active in aiding growers in the solution of their cultural and marketing problems, carrying on extensive experiments in its research laboratory.

Mr. Jackson was a director of the First National Bank of Tampa and last year was named the outstanding citizen of Tampa by the civic clubs of that city. He had held numerous positions of trust and responsibility in state and national organizations of public and semi-public nature.

TRENDS IN THE PROCESSING INDUSTRY /1
(Continued from page 14)

The system for these commodities is that canners contract with growers before planting what will be paid at harvest and then prices for the processed product are based on these contract prices. This system applied to citrus would deny the grower the privilege of choosing whether he will market his product in fresh or processed form.

The development of GAMTOX, by ORTHO laboratories has given to vegetable growers a new approach to the control of many insidious pests. In its use ORTHO fieldmen can give you valuable guidance.



GAMTOX has shown itself to be a highly effective aphicide. Most other sucking and chewing insects that infest row crops are knocked out by this ORTHO spray.

Where thrips have been causing damage, GAMTOX can be counted upon to clear them out.

GAMTOX is used as dust on soil for wireworms, and as dust or in baits for grasshoppers and crickets.

ORTHO Scientific Pest Control is applied in the most practical way. Through your ORTHO fieldman broad national experience is focused upon your practical pest control problem.

CALIFORNIA SPRAY-CHEMICAL CORPORATION
ORLANDO, FLORIDA



Only Strong, Healthy Trees Can Produce High Quality Fruit

And this season, more than for many years past, Quality Fruit is going to govern prices received for Florida Citrus . . . so with the heavy rains having depleted much of the plant food from our soil, we feel that an immediate application of Fall fertilizer is definitely in order.

Florida Favorite Fertilizers

Have demonstrated for years their exceptional productive capacity to growers throughout the whole of Florida's greatest citrus belt . . . and again this year our fertilizers offer the finest plant foods available for your trees, coupled with ample quantities of the vital secondary elements so valuable in promoting tree strength and crop quality.

Our Delivery Service Excels

Our customers know, too, that they can always depend on getting fertilizer ordered from us when they need it, because we deliver direct in our own fleet of trucks.

Florida  **Favorite**
FERTILIZER, INC.

Old Tampa Road

Lakeland, Florida

Storm Cuts Grapefruit Yield; Oranges Suffer Slighter Loss

The tropical storm of September 17-18 which crossed the state from a point near Fort Lauderdale on the Atlantic coast to a point near Fort Myers on the Gulf coast, missed the major citrus producing sections of the state but did much damage to fruit and trees in the southern section of the "belt."

Lake and Orange counties marked the extreme northern limit of damage from the winds, and here it is estimated that not more than one per cent of the fruit was lost or damaged. From this northern limit southward the loss was progressively greater. In northern Polk county it is estimated that the loss to oranges did not exceed one per cent with grapefruit injury placed at not more than 10 per cent. Further south in Polk county the orange loss is placed at 3 to 5 per cent; grapefruit 20 to 25 per cent.

DeSoto and Highlands counties place the orange loss at from 5 per cent for some budded groves to 40 per cent on some seedlings; grapefruit from 20 per cent in favored localities to 60 per cent in the more exposed locations.

Still further south where the center of the storm crossed the "belt" the loss was much greater, some individual growers reporting a total loss of fruit and much injury to trees, particularly to trees which

had suffered from storms of former years.

Best informed citrus circles place the loss for the state crop as a whole at from five to six million boxes, with grapefruit showing by far the greater loss. This does not take into account fruit which was bruised and thorn pricked and which may later drop from the trees. Loss from this source cannot be estimated at this time.

A second storm of much less intensity crossed the state from the Gulf to the Atlantic five days later, taking a path much further north along the northern edge of the "belt" but doing only minor damage.

Heavy rains which accompanied the storms added to the already saturated soils and in some low-lying sections caused injury to the trees. Rainfall during and immediately following the storms varied from four to nearly 15 inches, flooding many

groves in the flatwoods areas.

On the whole the citrus industry of the state escaped with far less loss than had been feared and less than would have been realized had the path of the storm crossed the main producing sections of the "belt."

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University Names 5 New Instructors To Agricultural Staff

Appointment of five new instructors to the staff of the College of Agriculture at the University of Florida is announced by Dr. H. Harold Hume, dean of the College and acting president of the University. The appointments have been approved by the State Board of Control.

Sidney P. Marshall, graduate of the University of Florida and Oklahoma A. & M. College, with a Ph.D. degree from the University of Minnesota, will become associate professor of dairy husbandry and associate dairy husbandman in the Experiment Station on October 1. He worked with the Station dairy herd while attending the college here and for over a year was with a large Guernsey farm in Oklahoma. For the past two years he has been associate in dairy husbandry with Clemson Agricultural College in South Carolina.

E. S. Ford, with a Ph.D. degree from the University of Chicago, is becoming associate botanist. He has had 20 years of teaching experience at Northwestern University, Cornell and the University of Tennessee.

Louis W. Ziegler, Davenport, is instructor in horticulture, succeeding Prof. Charles E. Abbott, who died August 14. A Florida graduate in the class of 1930, he has been production manager for a large citrus corporation at Haines City for the past seven years.

Earl Rodgers, another Florida graduate, is instructor in agronomy, succeeding L. V. P. Johnson, resigned. He has been assistant county agent at Wauchula and for the past few months has been graduate assistant in agronomy at the University.

Thomas C. Skinner, former vocational trainer of veterans at Williston, is a new instructor in agricultural engineering, replacing W. J. Cates, resigned.

Total cash receipt of farmers in the United States during the first eight months of 1947 were about 17.4 billion dollars or 21 per cent over income for the same months of 1946.

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Mandarin Rootstock Apparently Immune To Tristeza Disease

Cleopatra mandarin rootstock is highly resistant or immune to tristeza disease, or quick decline, of citrus in South America, Dr. A. F. Camp has reported to the State Plant Board in Gainesville, following a recent inspection trip to Concordia, Argentine Republic.

As a result of this information, demand for Cleopatra seed, particularly from Texas citrus growers already is heavy. Growers who may have seed for sale are asked to notify Dr. Camp at the Citrus Experiment Station, Lake Alfred, Fla., or Arthur C. Brown, Commissioner, State Plant Board, Gainesville, Fla.

Dr. Camp, vice director in charge of the Citrus Station and one of Florida's outstanding citrus authorities, went to South America to observe progress of the State Plant Board's tristeza investigations at Concordia. He reports that investigations are well under way, despite difficulties encountered in establishing such an undertaking in a

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foreign country.

He had noted indications of immunity among individual trees on previous trips. This time he observed a five-acre grove on Cleopatra mandarin stock planted about nine years ago.

When tristeza swept the area between 1940 and 1943 all citrus except lemons on sour orange stock either died or went out of production. Blocks of trees on sour orange were growing on either side of the grove on Cleopatra. Trees on sour orange were worthless, while those on Cleopatra had developed into normal size and showed every indication of being in good condition.

Seek Refrigeration Methods To Keep Produce Fresh

Improved methods of refrigerating fruits and vegetables from field to consumer will be sought in a project set up by the U. S. Department of Agriculture under the Research and Marketing Act of 1946, E. A. Meyer, administrator, has announced.

One phase of the study will deal with pre-cooling produce which is to be shipped in fresh form before it is shipped to determine possible benefits and to demonstrate how pre-cooling can be done advantageously. Another important phase will be to determine the advantages of prompt and continuous cooling of produce from the time it is harvested until canned or frozen.

Most of the investigations will be

conducted at the market end, however. The research will include information on losses in marketability due to wilting and shrinkage and a study of the advantages of refrigeration in preserving freshness and food value and in reducing spoilage. A comparison of different methods of refrigeration under varying conditions will also be made.

Kansas City, Mo., probably will be the principal market center for the study. Investigations will also be carried on in New York, Chicago, Baltimore and Washington, D. C., and in shipping districts as necessary.

Fruit and vegetable shippers, receivers and dealers, trade organizations both wholesale and retail, and transportation agencies will be asked to cooperate in the research program.

The Bureau of Plant Industry, Soils, and Agricultural Engineering will direct the project.

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